LIQUID ARGON MEASUREMENT STATUS REPORT

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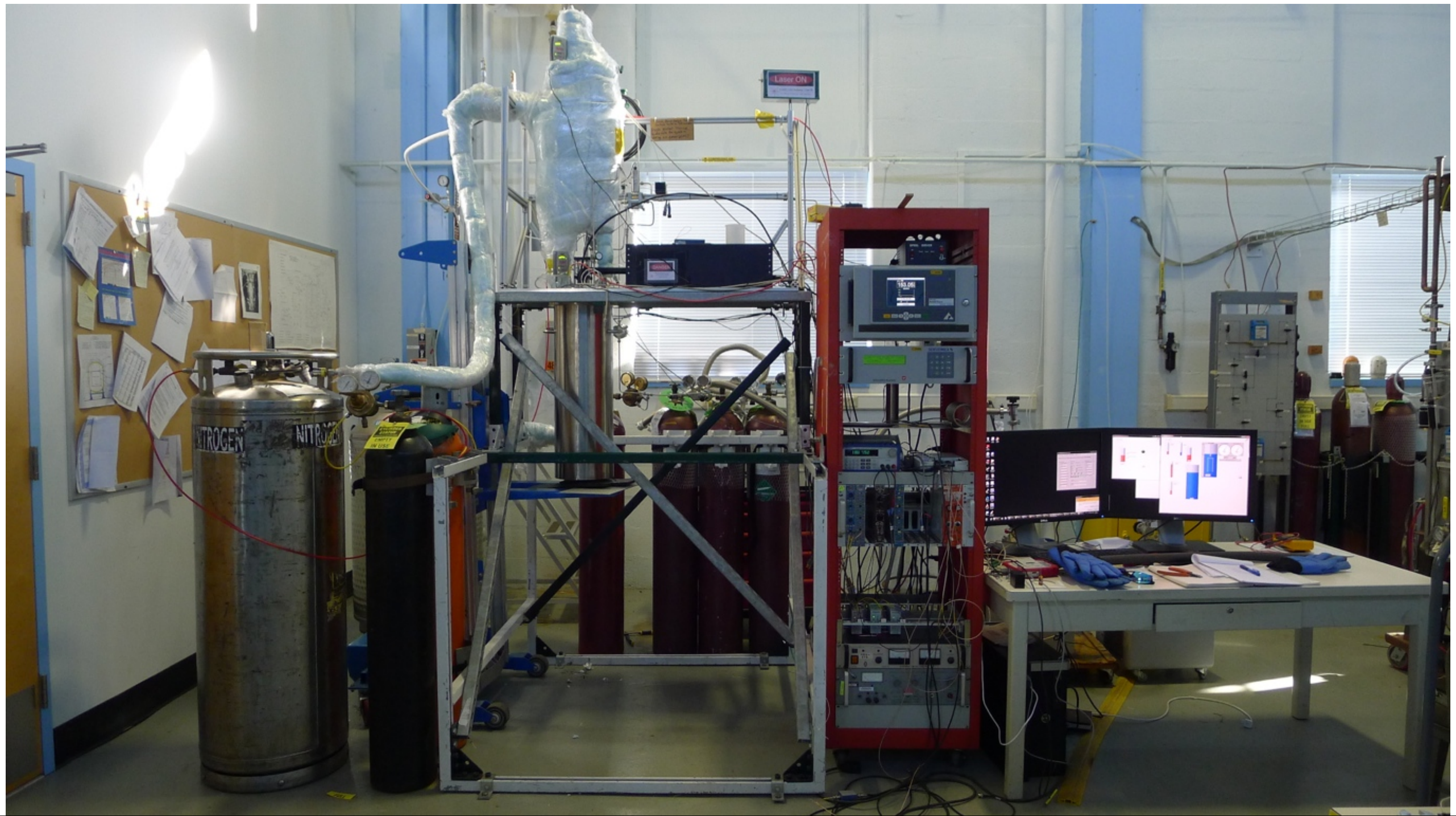
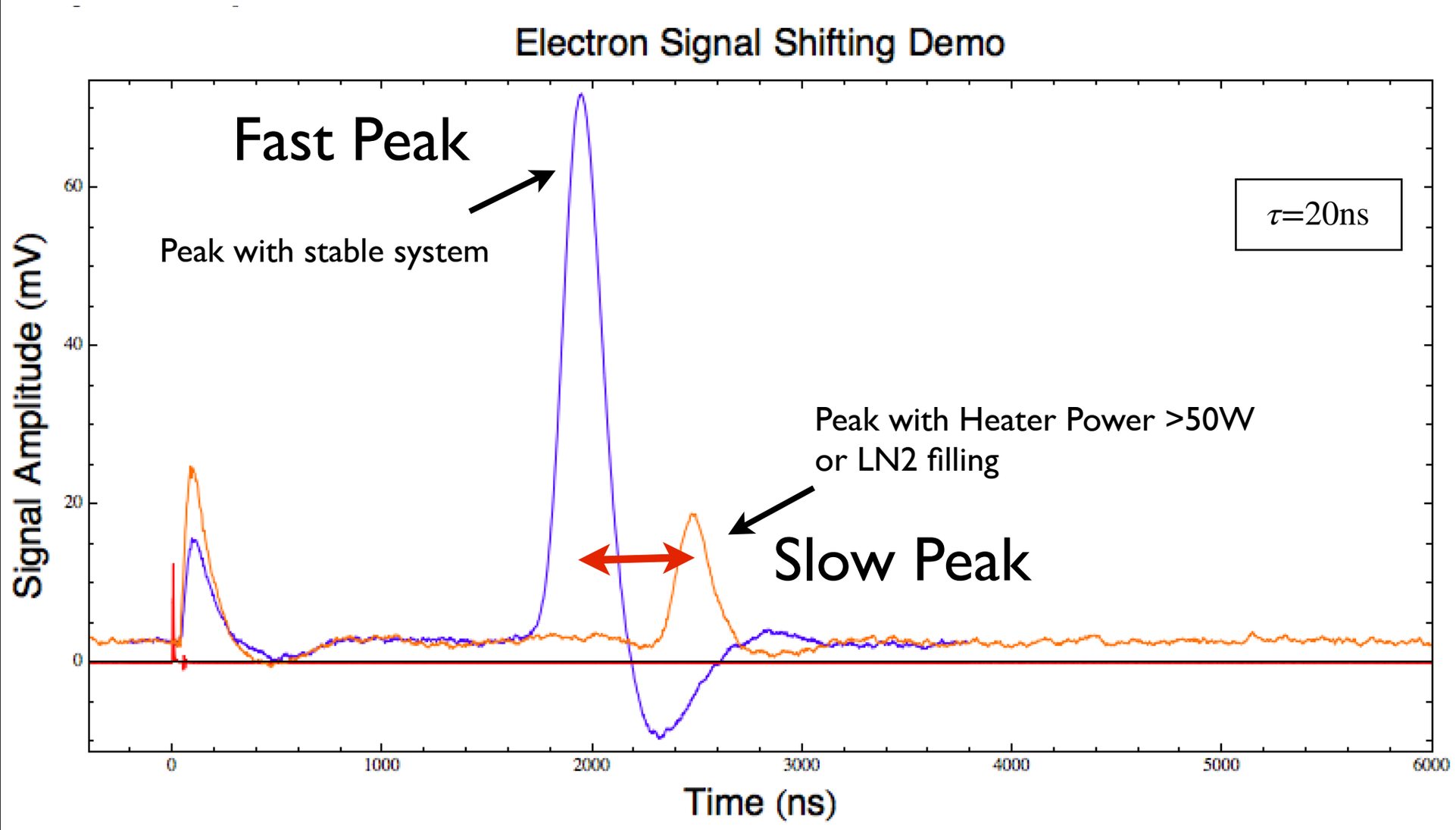
Introduction: Status

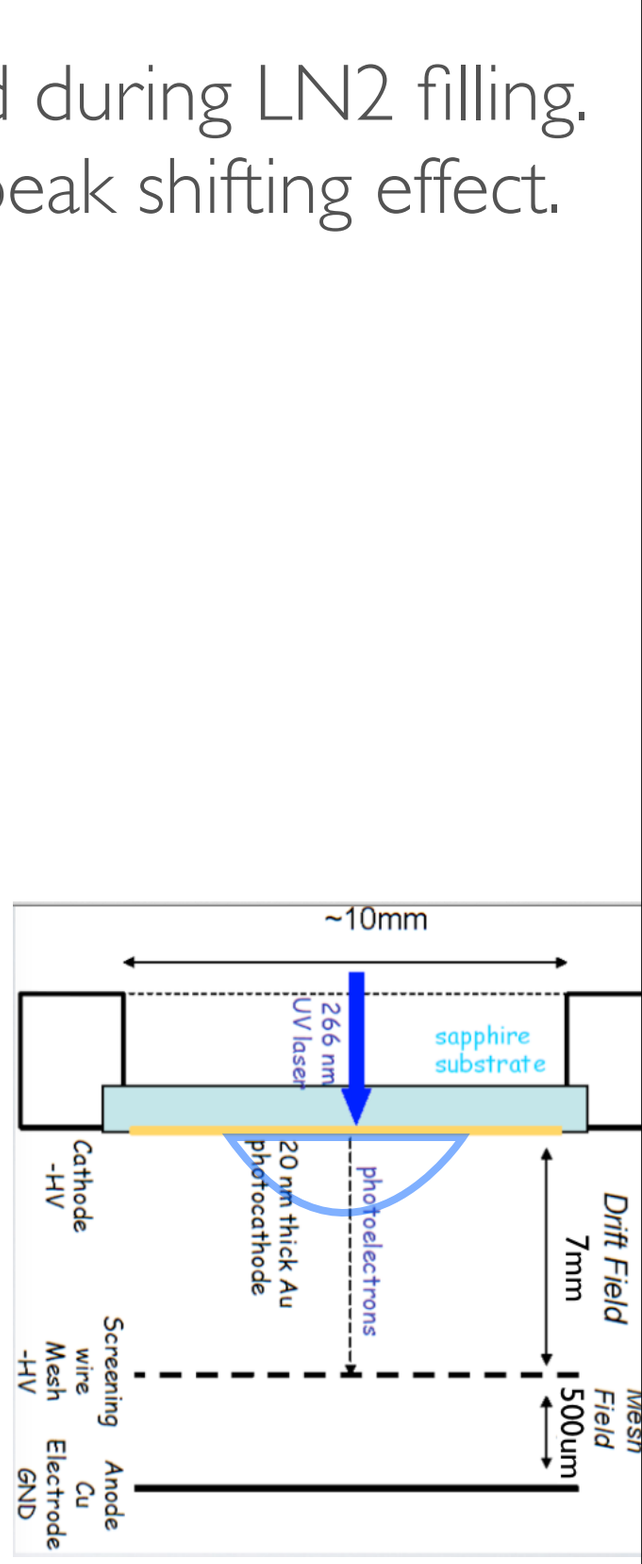
1. The Ar started to flow through the gas monitors since last week.
2. So far the LAr level has reduce from 19" to 12"
3. Schedule to warm up once the GAr and Vacuum measurements are done.



Signal Peak Shifting Study

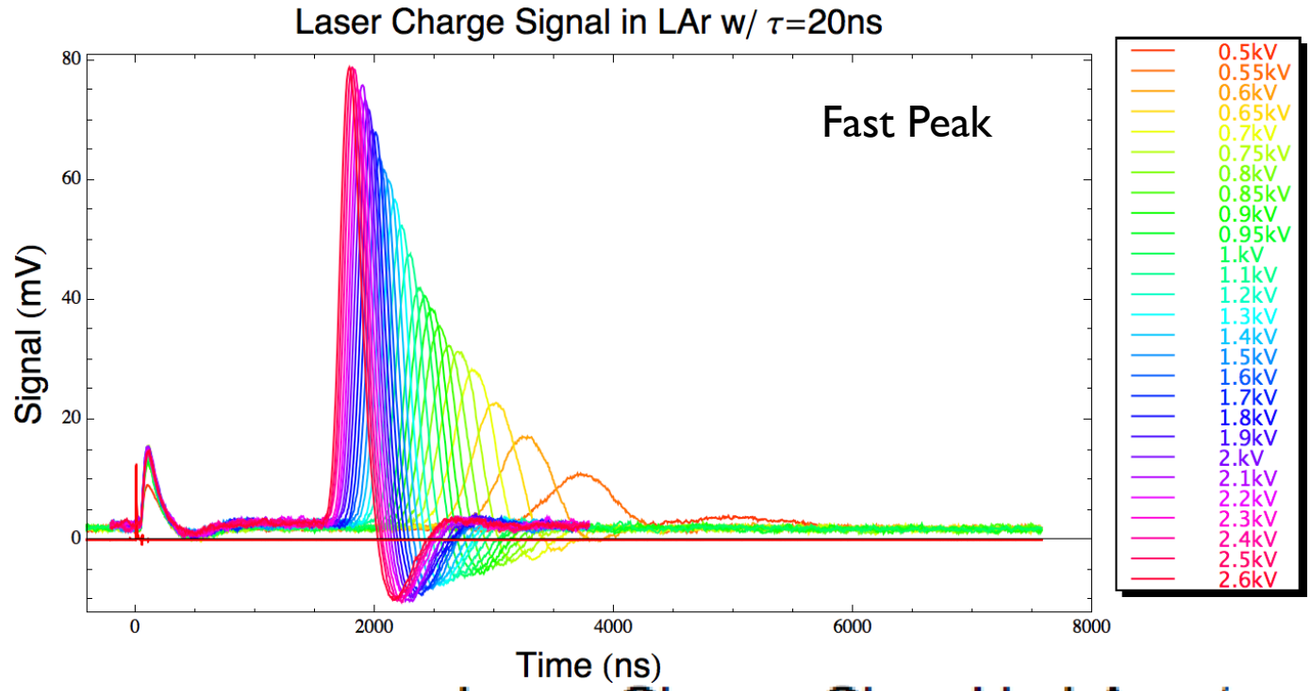
1. The charge signal peak shifting behavior has been observed during LN2 filling.
2. Turning on the heater immersed in the LAr has the same peak shifting effect.
3. The signal shifting is repeatable.
4. For convenience, I name the two peaks by Fast/Slow.

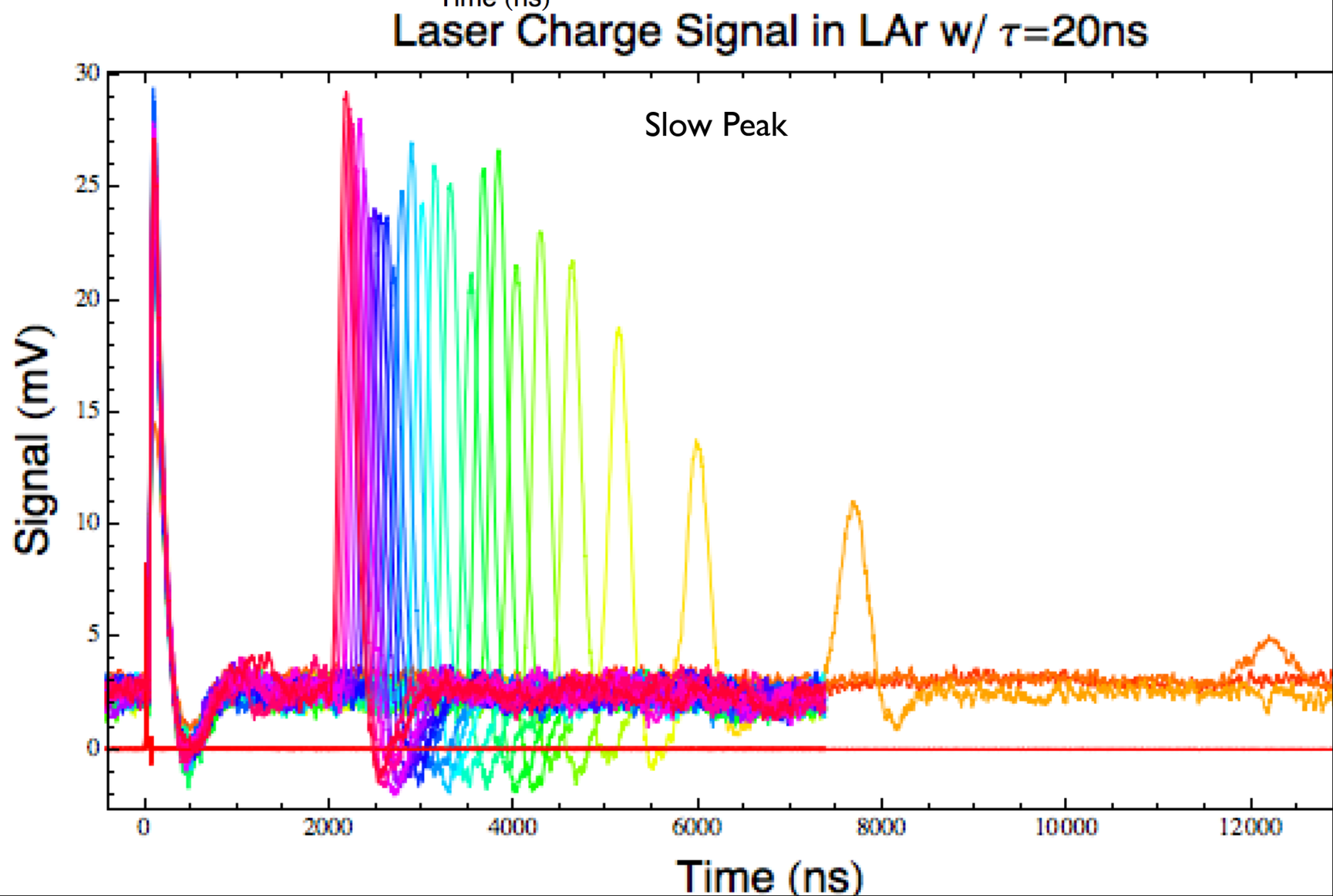




Results Comparison

1. The electron signal was measured from 0 field up to 3.0kV/cm with constant laser power.
2. The signal of the slower peak was measured with heater on.
3. Two sets of signal illustrate very different timing, i.e. drift velocity





Electric Field Uniformity Problem

1. Electric Field calculated by Maxwell 2D indicates very nonuniform electric field.
2. The two plots on the left show the calculated field distribution with 0.831kV to 0.831cm HV voltage applied.
3. The electron drift velocity in GAr and LAr are known.
4. The expected drift velocity can be calculated.
5. The influence of field uniformity to the drift velocity is negligible

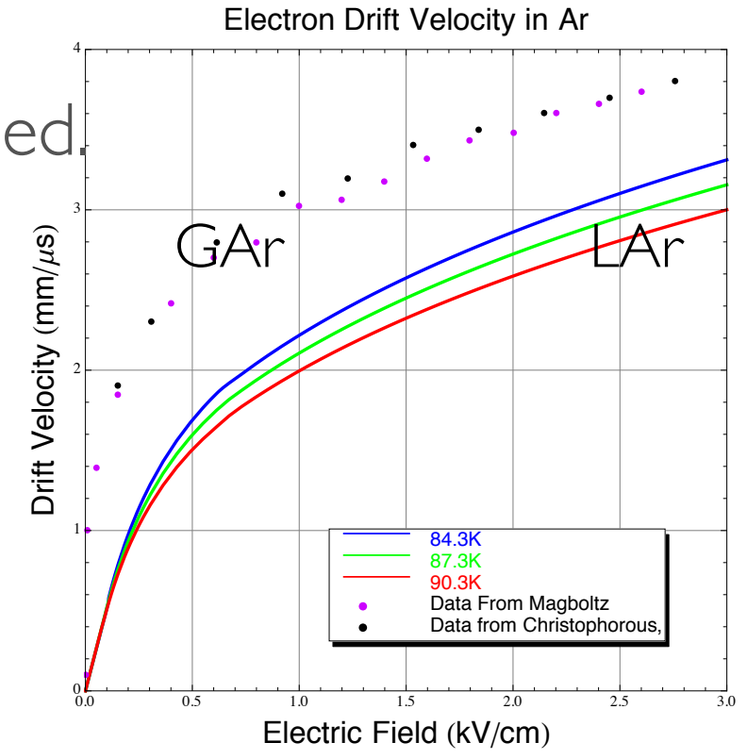
$$t = \int_0^d \frac{dx}{v(E(x))}$$

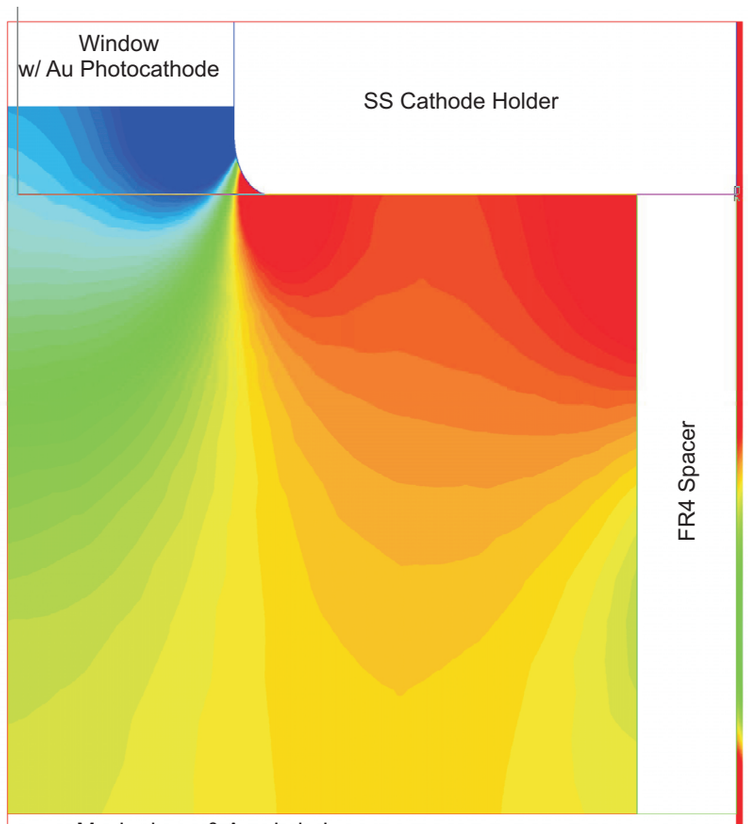
$$\bar{v} = \frac{d}{t}$$

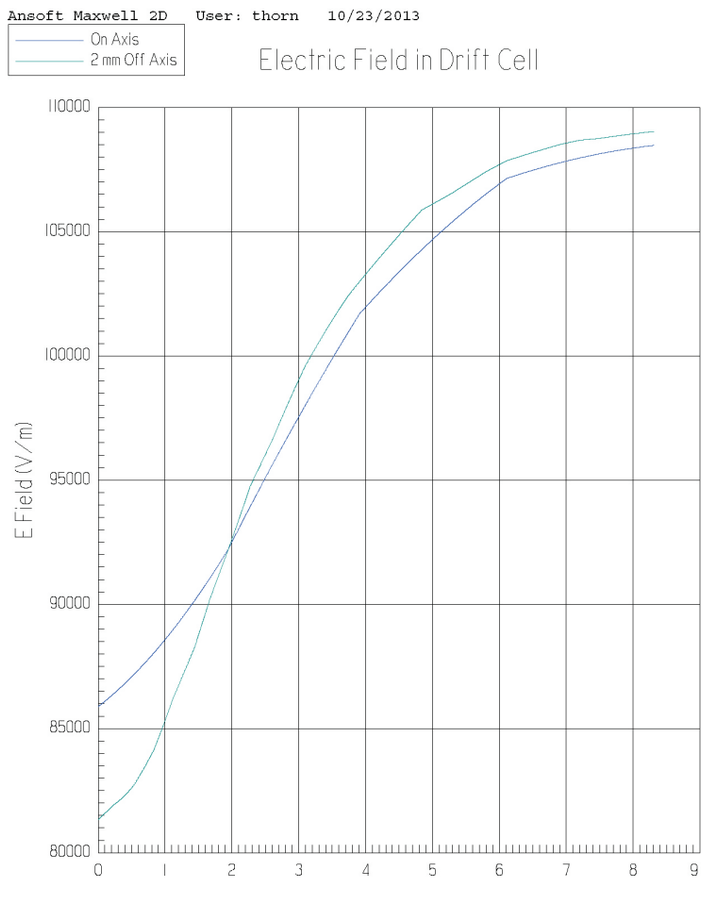
Uniform $\leftrightarrow$ Nonuniform

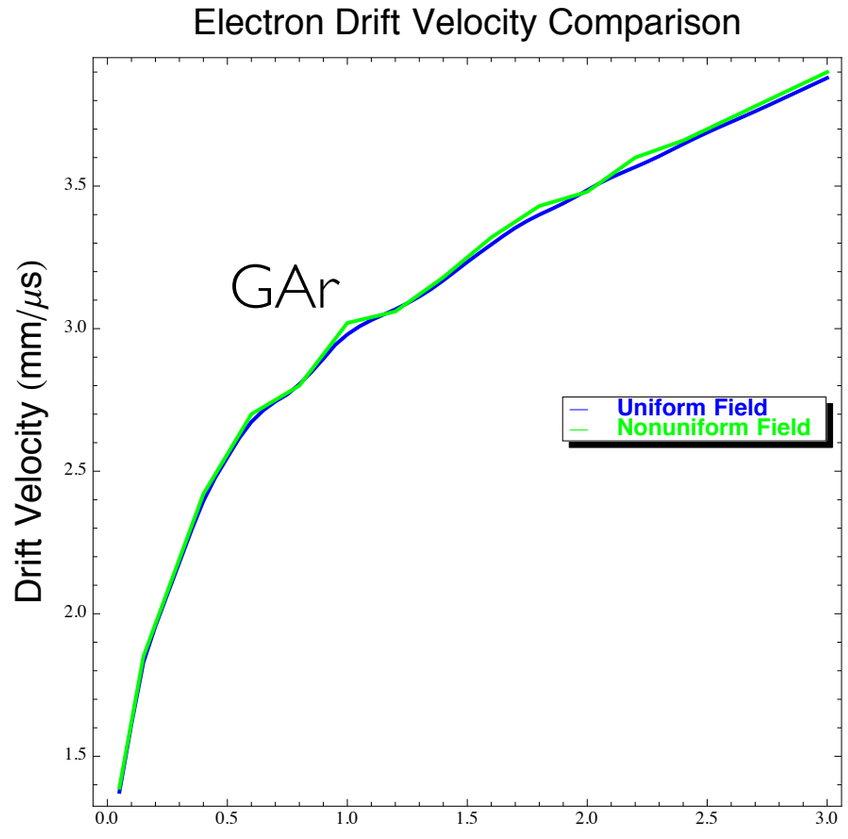
$$E \leftrightarrow E(x)$$

$$v(E) \leftrightarrow v(E(x))$$



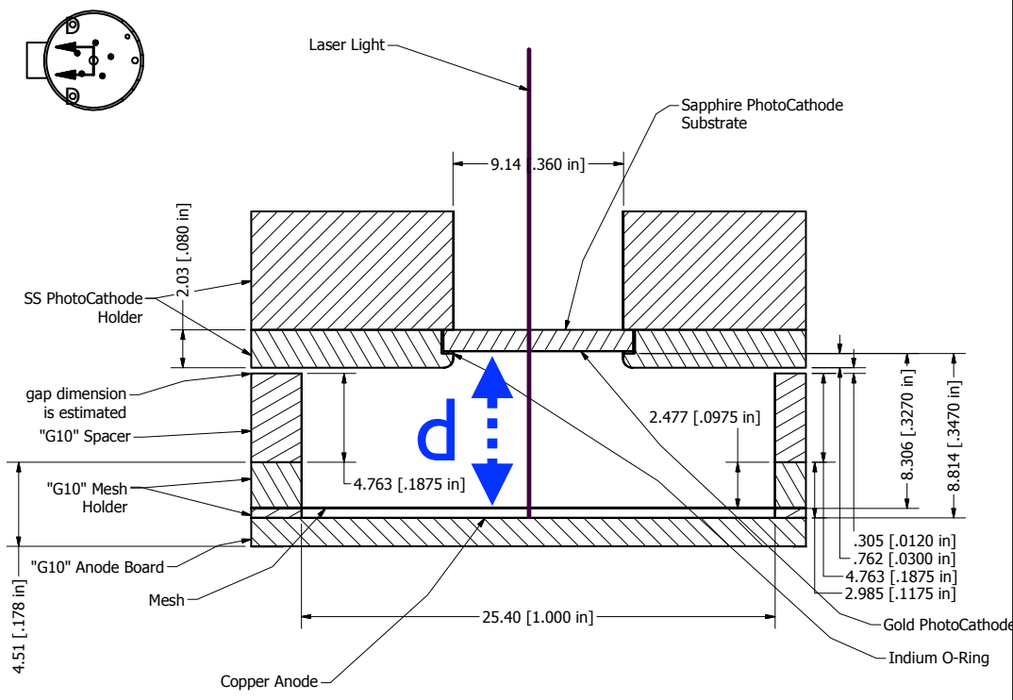


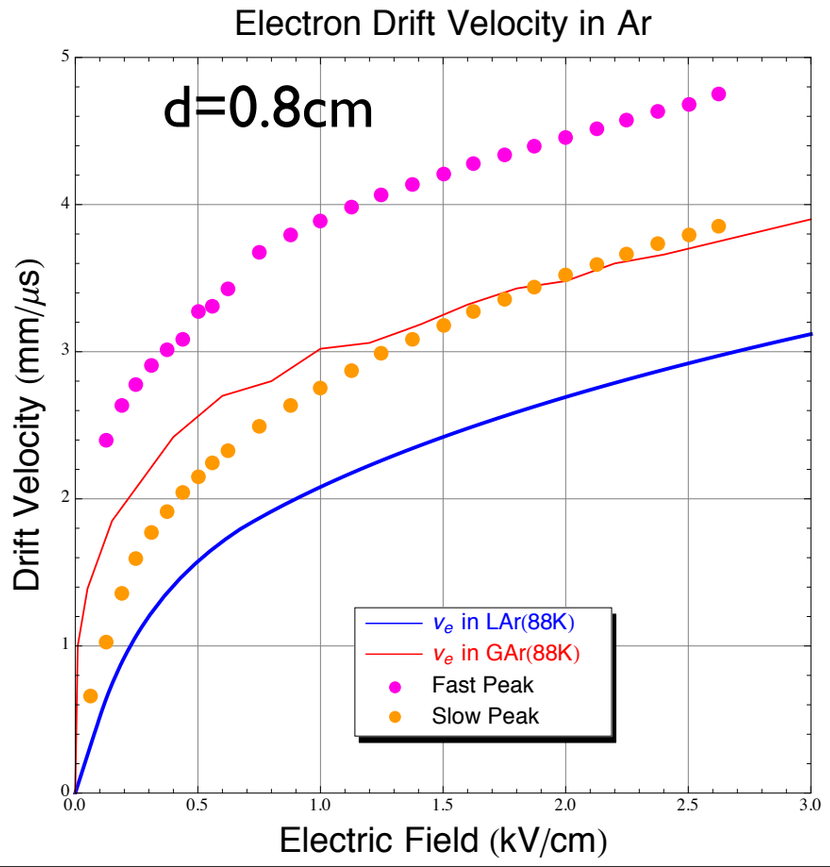


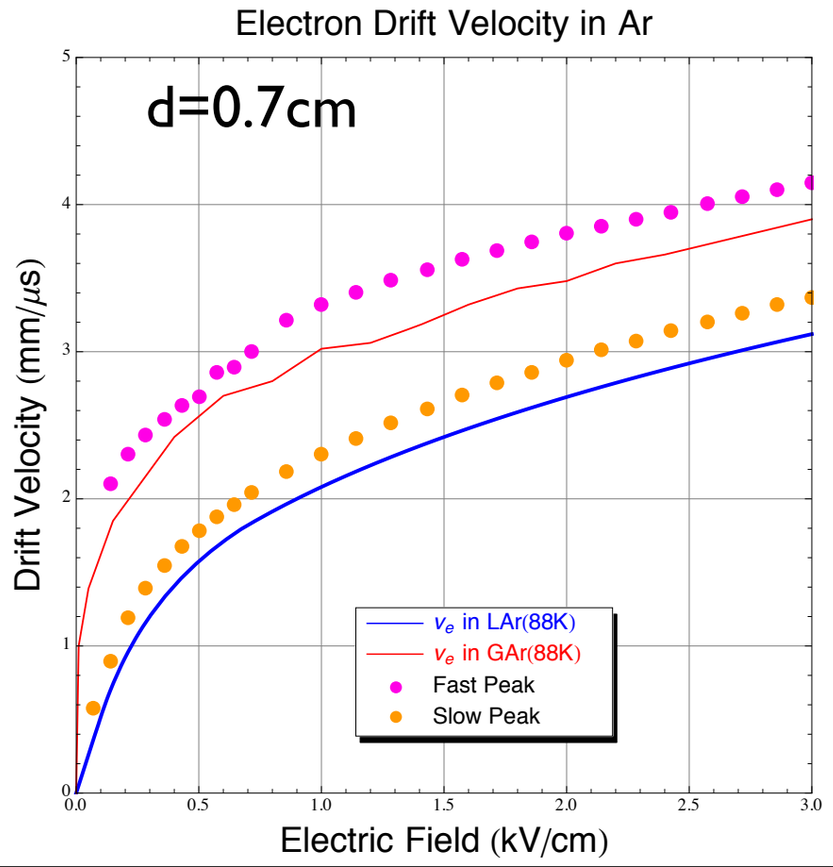


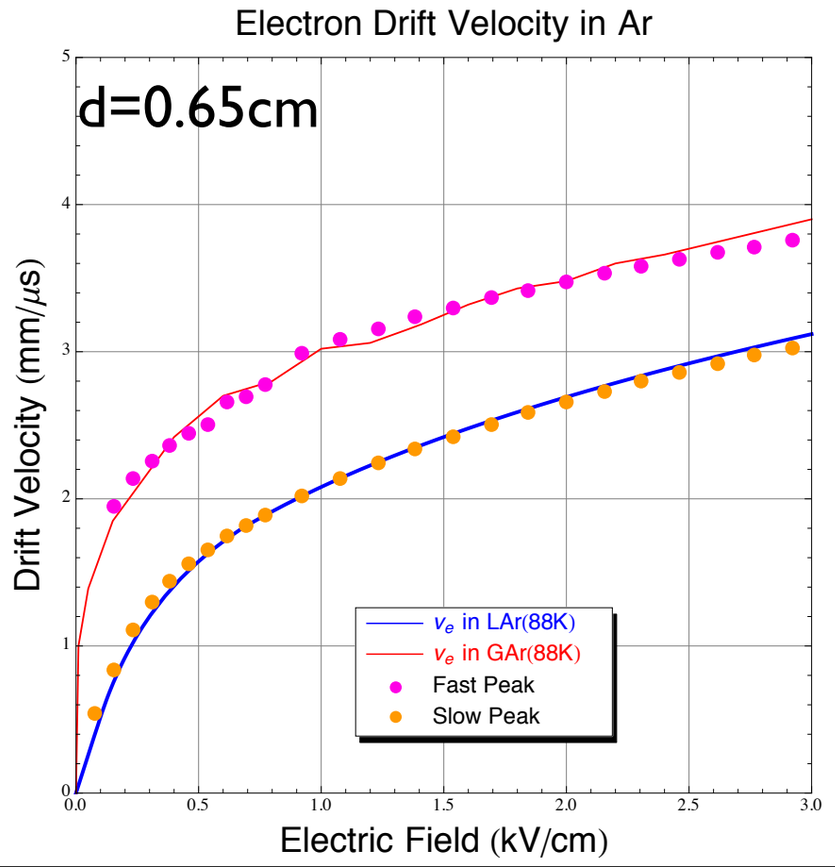
Electric Field Uniformity Problem

1. As the timing of electron signal should be precise, the difference of drift velocity can only be explained by the error on the drift distance.
2. The drift distance has significantly influence on the results and needs to be measured again once warmed up.
3. It is reasonable to conclude the fast peak is mainly electron drift in GAr when most of the volume is occupied by gaseous Ar while the slow peak is mainly in LAr. This can be tested in GAr measurement.



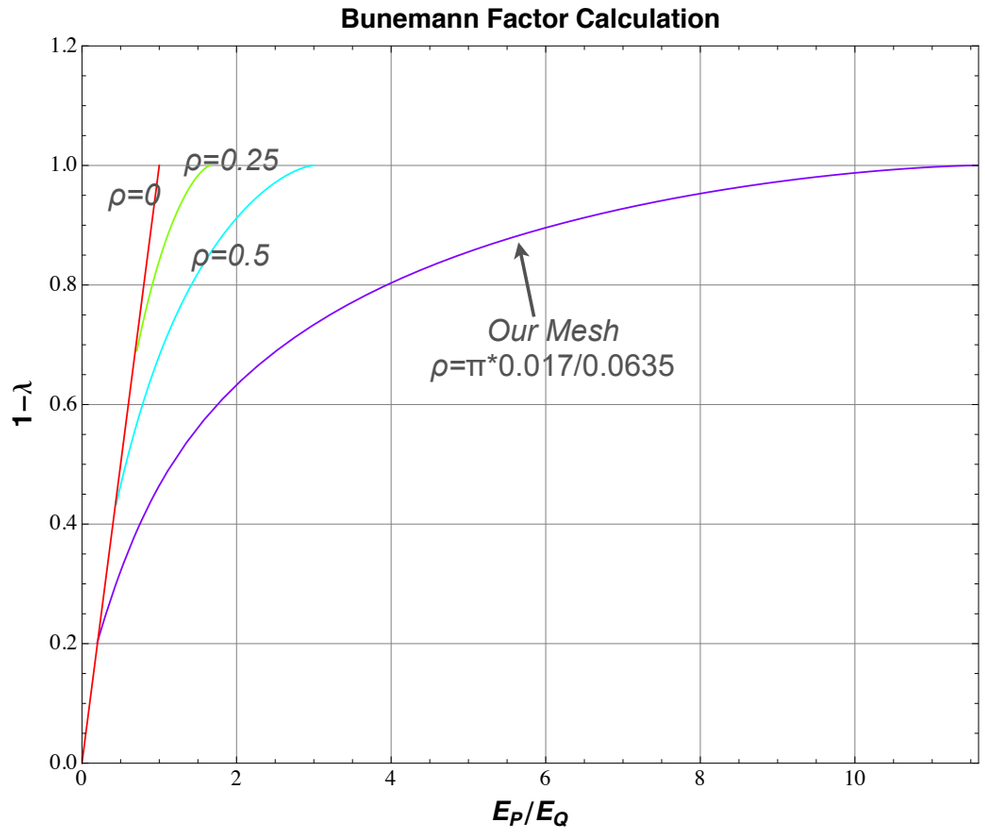


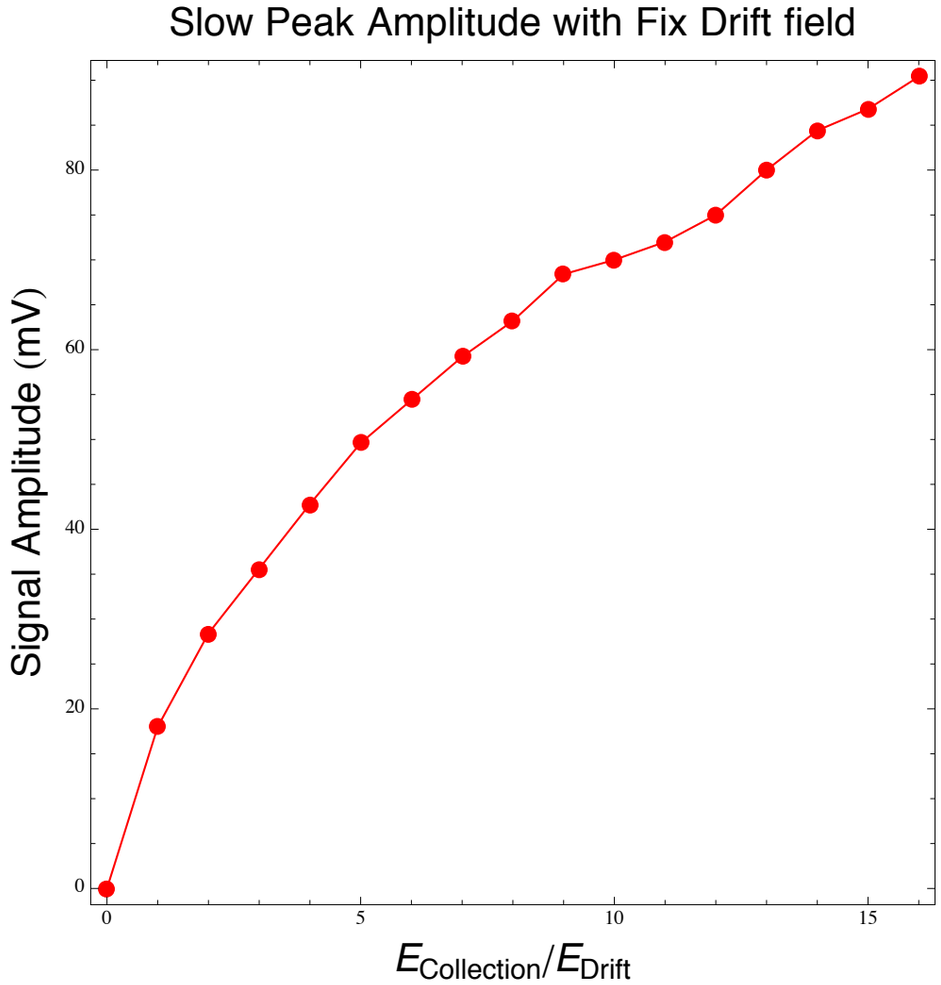


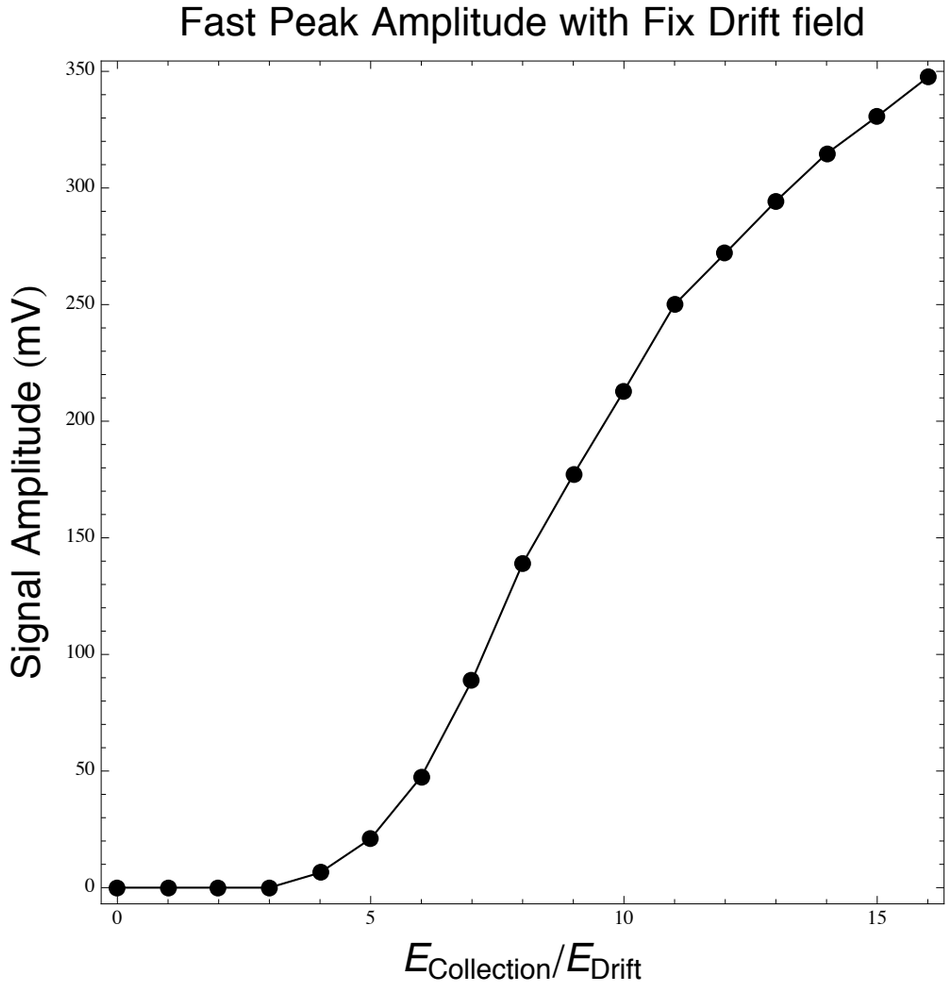


Bunneman Factor Measurement

1. Bunneman Factor is measured by fix the Drift field at ~1kV/cm assuming d=0.7cm and increasing collection field from 0 up to 16kV/cm
2. No plateau has been observed. Considering the drift distance may be shorter, the actual field ratio may not he high enough.







Summary

-The two different sets of electron signal are caused by different Ar phase.

-Current field is not quite uniform.

-The drift distance has significantly influence on the results and needs to be measured more precisely.

-GAr and Vacuum measurement are very important.